



Source Code Management

Terraform-day2 – module-7

Learning Objectives

By the end of this module you will understand:

- Why version control is essential for Infrastructure as Code
- What GitOps is and how it applies to Terraform
- How .gitignore protects sensitive Terraform files
- The branching workflow for team collaboration
- How Pull Requests enable code review

Why Version Control for Infrastructure?

The Problem Without Version Control:

Imagine managing Terraform without Git:

- `main.tf` (which version is this?)
- `main_v2.tf` (what changed?)
- `main_final.tf` (really final?)
- `main_final_ACTUALLY_FINAL.tf` (not really!)

Questions you can't answer:

- Who changed the security group rule last week?
- What did the infrastructure look like 2 months ago?
- How do you undo a mistake?
- How do multiple people work without overwriting each other?

What Version Control Provides

Git gives you:

- Version history - every change tracked with who, what, when, why
- Collaboration - multiple people work in parallel safely
- Code review - changes reviewed before applied
- Audit trail - know exactly what changed and when
- Rollback capability - undo mistakes easily
- Branching - experiment safely without affecting production

What is GitOps?

GitOps is a way of managing infrastructure where:

Git is the single source of truth for your infrastructure

The core idea:

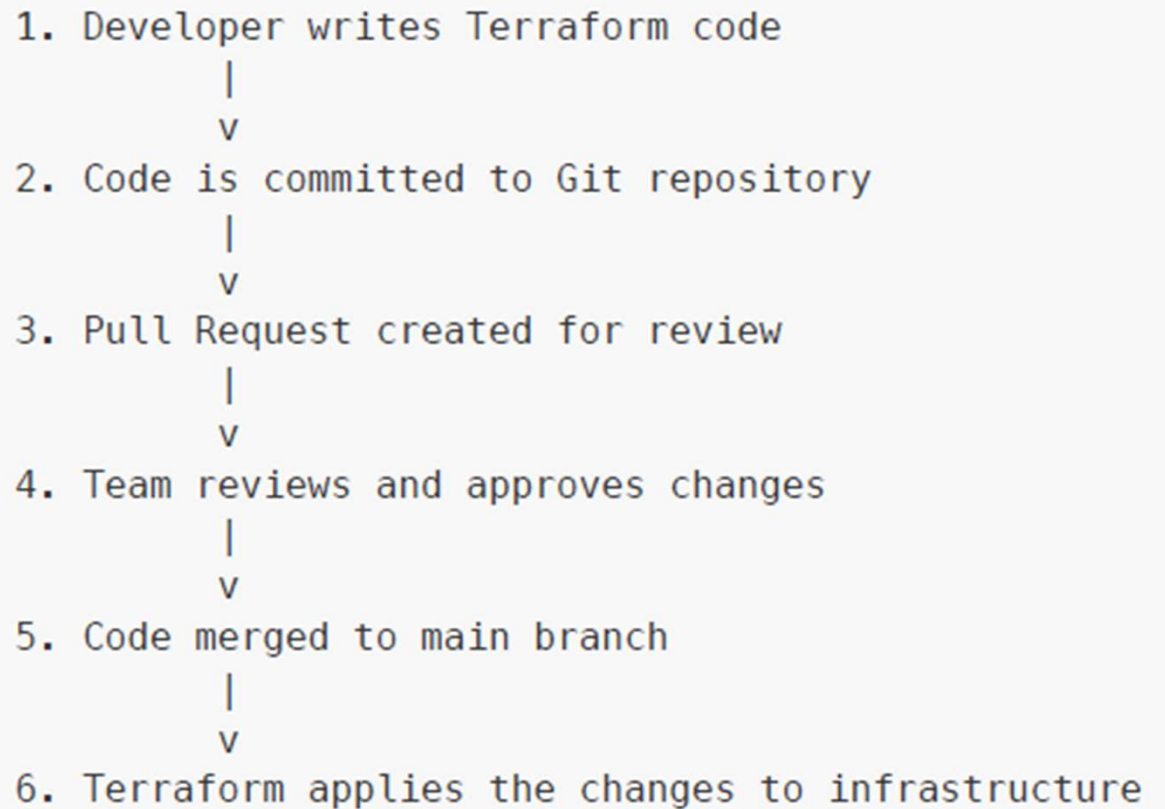
- Your infrastructure is defined in code (Terraform files)
- That code lives in a Git repository
- Any change to infrastructure starts with a change in Git
- Git history becomes your infrastructure history

GitOps Workflow

How changes flow in GitOps:

This workflow ensures every infrastructure change is:

- Reviewed before applied
- Tracked in version history
- Reversible if needed



Benefits of GitOps for Terraform

GitOps is a way of managing infrastructure where:

Git is the single source of truth for your infrastructure

Benefit	What It Means
Auditability	Complete history of who changed what and when
Reproducibility	Anyone can recreate the infrastructure from code
Collaboration	Teams can work together without conflicts
Review	Changes are checked before going to production
Rollback	Easy to revert to a previous working version

How Git and Terraform Work Together

The relationship:

- Terraform files (.tf) define your infrastructure
- Git tracks changes to those files over time
- Remote repository (GitHub) stores the code for the team
- Branches let you work on changes without affecting others
- Pull Requests let the team review before applying

Key insight: Treat your Terraform code with the same care as application code!

The .gitignore File

What is .gitignore?

A special file that tells Git which files to ignore (not track).

Why it matters for Terraform:

Terraform creates several files that should NOT be committed:

- State files (contain sensitive infrastructure data)
- Downloaded providers (large, regenerated automatically)
- Variable files with actual values (may contain secrets)

The **.gitignore** file protects you from accidentally committing these files.

What .gitignore Excludes for Terraform

Files that should be ignored:

Git is the single source of truth for your infrastructure

File/Directory	Why Ignore It
<code>.terraform/</code>	Downloaded providers, regenerated on init
<code>*.tfstate</code>	Contains sensitive data, should be stored remotely
<code>*.tfstate.*</code>	Backup state files
<code>*.tfvars</code>	May contain passwords and secrets
<code>override.tf</code>	Local overrides not meant for the team

What to Commit to Git

DO commit these files:

- `.tf` files - All Terraform configuration
- `.gitignore` file - Tells Git what to ignore
- `terraform.tfvars.example` - Template showing what variables are needed
- `.terraform.lock.hcl` - Locks provider versions for consistency
- `README.md` - Documentation for your project

What NOT to Commit

DO NOT commit these files:

- `terraform.tfstate` - Contains sensitive infrastructure data
- `.terraform/` directory - Downloaded providers, temporary files
- `*.tfvars` with real values - May contain passwords and API keys
- Any file with secrets - Passwords, credentials, private keys

Remember: If it contains secrets or is auto-generated, don't commit it!

Branching Strategy Overview

Why use branches?

- Work on changes without affecting the main code
- Have multiple people work at the same time
- Review changes before they go live
- Keep a stable main branch

The Three-Branch Workflow

A simple branching strategy:

```
|main (production-ready code)
| ^
| |
| |develop (integration branch)
| | ^
| | |
| | |feature/my-change (your work)
```

How it works:

- -. **main** - Always contains stable, working code
- /. **develop** - Where features are integrated and tested
- 0. **feature/*** - Where you do your actual work

Branch Flow

The typical workflow:

- Start from develop branch
- Create a new feature branch for your work
- Make changes and commit them
- Push your branch to the remote repository
- Create a Pull Request to merge into develop
- Team reviews your changes
- After approval, merge into develop
- Delete the feature branch (it's done!)

What is a Pull Request?

A Pull Request (PR) is:

- A request to merge your branch into another branch
- An opportunity for the team to review your code
- A discussion forum about the change
- A record of what changed and why

Also called: Merge Request (MR) in some systems like GitLab

Why Pull Requests Matter

Pull Requests provide:

Benefit	Description
Code Review	Others check your work before it goes live
Discussion	Team can ask questions and suggest improvements
Quality Control	Catch mistakes before they affect infrastructure
Documentation	The PR description explains what changed and why
Approval Workflow	Require sign-off before changes are applied

The Pull Request Process

How a Pull Request works:

- You push your feature branch to the remote repository
- You create a Pull Request (usually through the web interface)
- You describe what changes you made and why
- Team members review the changes
- They may request modifications
- Once approved, you merge the Pull Request
- The feature branch can be deleted

Code Review Basics

What to look for when reviewing Terraform code:

Security:

- No hardcoded secrets or credentials
- Encryption enabled where appropriate
- Access properly restricted

Best Practices:

- Resources have meaningful names
- Variables used instead of hardcoded values
- Proper tags applied

Quality:

- Code is formatted consistently
- Changes make sense for the stated purpose

Key Takeaways

- Version control is essential for IaC - Track every infrastructure change
- GitOps uses Git as the source of truth - All changes flow through Git
- Use .gitignore to protect secrets - Never commit state files or credentials
- Branches enable safe collaboration - Work without affecting others
- Pull Requests enable review - Catch issues before production
- Treat infrastructure as code - Same practices as software development